REMARKS

The Examiner mailed a Notice of Non-Compliant Amendment under 357 CFR 1.121 on September 21, 2005, stating that in the response to the Office Action of December 21, 2004, not all added text have been underlined. Additionally, the Examiner pointed out to a spelling error in claim 1.

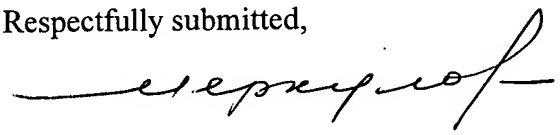
Responding to these objections, all claims have been reviewed and missed underlining has been added where needed. The spelling error in claim 1 also has been corrected.

Additionally, a copy of the cited pages from the book MPEG Video Compression Standard, mentioned on page 30 of the response, is included for the Examiner's reference with this paper.

The Examiner is respectfully requested to consider the response to the outstanding office action submitted on May 23, 2005, with the amendment of claims provided herewith.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041 (Whitham, Curtis & Christofferson, P.C.).

Respectfully submitted,



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Digital Multimedia Standards Series

MPEG VIDEO COMPRESSION STANDARD

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Cover design: Curtis Tow Graphics

Printed in the United States of America

Chapman & Hall
115 Fifth Avenue
New York, NY 10003

Chapman & Hall
2-6 Boundary Row
London SE1 8HN
England

Thomas Nelson Australia
102 Dodds Street
South Melbourne, 3205
Victoria, Australia

Chapman & Hall GmbH
Postfach 100 263
D-69442 Weinheim
Germany

International Thomson Editores
Campos Eliseos 385, Piso 7
Col. Polanco
11560 Mexico D.F
Mexico

International Thomson Publishing–Japan
Hirakawacho-cho Kyowa Building, 3F
1-2-1 Hirakawacho-cho
Chiyoda-ku, 102 Tokyo
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International Thomson Publishing Asia
221 Henderson Road #05-10
Henderson Building
Singapore 0315

1 2 3 4 5 6 7 8 9 10 XXX 01 00 99 98 97 96

Library of Congress Cataloging-in-Publication Data

MPEG video : compression standard / Joan L. Mitchell . . . [et al.].
p. cm.
Includes bibliographical references and index.
ISBN 0-412-08771-5 (alk. paper)
1. Digital video. 2. Video compression -- Standards. 3. Sound -
- Recording and reproducing -- Digital techniques -- Standards.
4. Coding theory. I. Mitchell, Joan L.
TK6680.M64 1996
621.388--dc20 96-31124
CIP

British Library Cataloguing in Publication Data available

after every sequence header in the sequence. After the four-bit identifier ('0010'), one of six video formats can be specified as shown in Table 10.7. These are the source material formats prior to conversion to the YCbCr format used in the encoder.[7]

If detailed color primaries, transfer characteristics, and matrix coefficients are desired, the `colour_description` flag is set to '1'.

The chromaticity coordinates for the source primaries are given in Table 10.8. If `colour_primaries` are not explicitly set, then a default value of 1 is assumed. Additional information about color primaries and chromaticity coordinates can be found in Chapter 4.

The transfer characteristics are given in Table 10.9. A tutorial on color spaces and gamma correction is found in Chapter 4.

Table 10.10 lists the codes for the `matrix_coefficients`. In this table E'_Y, E'_R, E'_G, and E'_B range from 0 to 1. E'_{PB} and E'_{PR} range from -0.5 to $+0.5$. The formulas deriving the Y, Cb, and Cr are given below:

$$Y = (219E'_Y) + 16 \tag{10.3}$$

$$Cb = (224E'_{PB}) + 128 \tag{10.4}$$

$$Cr = (224E'_{PR}) + 128 \tag{10.5}$$

The display width and height can be sent in `display_horizontal_size` (in units of samples of the encoded frame) and `display_vertical_size` (in units of lines of the encoded frame). They may define a display size that is smaller or larger than the frame size. How these values are used is not standardized.

The relationships between SAR, DAR, and display size are as follows:

$$SAR = \frac{DAR \times \texttt{display\_horizontal\_size}}{\texttt{display\_vertical\_size}} \tag{10.6}$$

10.3 MPEG-2 GOP header ●

Figure 10.7 shows the syntax for the group of pictures header. The data elements have the same meaning as the MPEG-1 GOP (see Figure 8.7). The `closed_gop` flag is set to '1' if the pictures in the GOP do not depend on pictures outside the GOP. Thus, if B-pictures preceding the first I-picture in the GOP (in display order) depend only upon backward motion vectors, the `closed_gop` flag is set to '1'. It is set to '0' if forward motion vectors are used, because these vectors reference pictures outside the group.

The `broken_link` flag is always set to '0' in the encoder to indicate a conforming, decodable bitstream. The flag can be set to '1' in parts of a

[7] See Section 9.7 for background information about these video formats.

reference standard	primary	x	y	colour_primaries
forbidden				'0000 0000'
Rec. ITU-R BT.709	green blue red white D65	0.300 0.150 0.640 0.3127	0.600 0.060 0.330 0.3290	'0000 0001' (default)
unspecified video	unknown characteristics			'0000 0010'
reserved				'0000 0011'
Rec. ITU-R BT.470-2 System M	green blue red white C	0.21 0.14 0.67 0.310	0.71 0.08 0.33 0.316	'0000 0100'
Rec. ITU-R BT.470-2 System B, G	green blue red white D65	0.29 0.15 0.64 0.313	0.60 0.06 0.33 0.329	'0000 0101'
SMPTE 170M	green blue red white D65	0.310 0.155 0.630 0.3127	0.595 0.070 0.340 0.3290	'0000 0110'
SMPTE 240M (1987)	green blue red white D65	0.310 0.155 0.630 0.3127	0.595 0.070 0.340 0.3291	'0000 0111'
reserved ... reserved				'0000 1000' ... '1111 1111'

Table 10.8: MPEG-2 colour_primaries codes.

```
group_of_pictures_header() {    /* from ISO 13818-2 6.2.2.6        */
  group_start_code(32);         /* r/w 0x000001B8                  */
  time_code(25);                /* r/w time code                   */
  closed_gop(1);                /* r/w nature of B-pictures        */
  broken_link(1);               /* r/w encoder: 0; editor: 0,1     */
  next_start_code();            /* find next start code            */
}                               /* end group_of_pictures_header()  */
```

Figure 10.7: MPEG-2 group_of_pictures_header() function.

```
extension_and_user_data_G() {        /* from ISO 13818-2 6.2.2.2  */
  while((nextbits(32)==extension_start_code) ||
         (nextbits(32)==user_data_start_code)) {
                                     /*while 0x000001B5 or 0x000001B2 */
    if (nextbits(32)==user_data_start_code) /* if 0x000001B2       */
      user_data();                   /* r/w user data              */
  }                                  /* end while 0x000001B5 or...*/
}                                    /* end ext._and_user_data_G()*/
```

Figure 10.8: MPEG-2 `extension_and user_data_G()` function. If present, this follows the group of pictures header.

bitstream where an editor has removed or inserted data that make those parts undecodable. Since only 28 bits follow the `group_start_code`, the next_start_code() function must pad at least four bits.

In the current MPEG-2 profiles, the only extension and user data allowed after the GOP header is user data. This is shown in Figure 10.8.

10.4 MPEG-2 picture header and extensions ●

The syntax for the picture header is shown in Figure 10.9. It is quite similar to the header part of the MPEG-1 `picture()` function (see Figure 8.9). However, there are significant new restrictions and conventions. After the `picture_start_code` (0x00000100), the `temporal_reference` gives the display count, modulus 1024.

When `low_delay` is set to '0', MPEG-1 conventions still apply. The temporal reference is incremented by one for each frame in display order, and after a GOP header it is reset to zero. Both fields in a frame receive the same temporal reference number.

If the `low_delay` is set to '1' and a big picture occurs such that the picture is not complete in one picture time interval, the VBV buffer is reexamined N times ($N > 0$) and the temporal reference is incremented by $N + 1$ (modulo 1024).[8] If the big picture is followed immediately by a GOP header, then the temporal reference of the first coded picture in the GOP is set to N rather than zero. If the big picture is the first field of a frame, then the first field takes at least one picture time interval and the second field will not have the same temporal reference as the first field.

The `picture_coding_type` uses the same codes as MPEG-1 (see Table 8.5 except that D-pictures (code '100') "shall not be used." The 16-bit

[8] If N=0, the buffer is not reexamined. This means that the picture is removed and decoded normally after one picture time interval.